

REMARKS**INTRODUCTION:**

Papers submitted under 35 U.S.C. §119(a)-(d) were acknowledged as received.

The Information Disclosure Statement submitted on August 1, 2002 has been considered.

Claims 1, 8, 12, 13, and 33 were objected to because of informalities.

Claims 1-35 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Claims 1-33 were rejected under 35 U.S.C. § 102(e) as being anticipated by Chu et al.

(USPN 6,030,720). Claims 1-33 were rejected under 35 U.S.C. § 102(e) as being anticipated by Nimon et al. (USPN 6,225,002). Claims 1-35 were rejected under 35 U.S.C. § 102(e) as being anticipated by Katz et al. (USPN 6,358,643).

These rejections are respectfully traversed.

In accordance with the foregoing, claims 1, 8, 12, 13, 19, 31, 32 and 33 have been amended. No new matter has been added.

Claims 1-35 are pending and under consideration.

Reconsideration is requested.

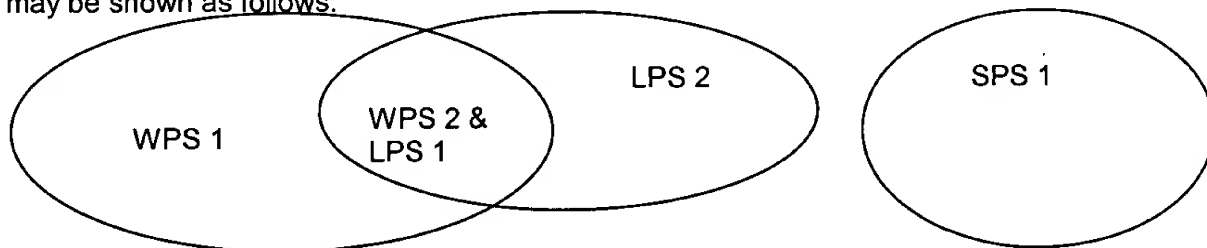
REJECTION UNDER 35 U.S.C. §112

In the Office Action at pages 2-3, claims 1-35 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Reconsideration is requested.

The Examiner points out that certain solvents may belong to both the weak polar solvent group and the lithium protection solvent, causing indefiniteness. However, it is respectfully submitted that this is not the case.

For example, amended claim 1 reads, in part: "...the mixed organic solvents of said electrolyte comprise at least two different groups selected from the group consisting of a weak polar solvent (WPS) group, which is capable of dissolving elemental sulfur, a strong polar solvent (SPS) group, which is capable of dissolving lithium polysulfide, and a lithium protection solvent (LPS) group, which forms a good protective layer on a lithium surface..." (abbreviations added) Pictorially, this may be shown as follows:



Thus, if a solvent belonging to the overlapping intersection of the WPS group and to the LPS group, e.g., WPS 2 and LPS 1, is selected, then such a solvent may be said to belong to both the WPS group and the LPS group. Hence, to select a solvent from at least two different groups, it is clear that a second solvent must be selected from the SPS group. In contrast, if WPS 1 is selected, either LPS 2 or SPS 1 may be selected as the second solvent. Thus, although two overlapping solvent groups are recited, the user follows the limitations set forth in the claims to select the solvents appropriately. Hence, it is submitted that it is clear how the solvents are selected to provide the mixed solvent.

Thus, it is respectfully submitted that claims 1-35 are in allowable form under 35 U.S.C. § 112, second paragraph, and said claims are not indefinite.

REJECTION UNDER 35 U.S.C. § 102:

In the Office Action, at pages 3-5, claims 1-33 were rejected under 35 U.S.C. § 102(e) as being anticipated by Chu et al. (USPN 6,030,720; hereafter "Chu"). In the Office Action, at pages 6-8, claims 1-33 were rejected under 35 U.S.C. § 102(e) as being anticipated by Nimon et al. (USPN 6,225,002; hereafter "Nimon"). In the Office Action, at page 8, claims 1-35 were rejected under 35 U.S.C. § 102(e) as being anticipated by Katz et al. (USPN 6,358,643; hereafter "Katz").

These rejections are traversed and reconsideration is requested.

With respect to the rejection of claims 1-33 under 35 U.S.C. § 102(e) as being anticipated by Chu et al. (USPN 6,030,720; hereafter designated "Chu"), it is respectfully noted that the present application cites Chu in paragraph 6 of page 2 of the specification as an example of using donor or acceptor solvents in addition to a compound with an ethoxy repeating unit to provide a liquid electrolyte solvent. However, such a combination does not provide an optimal electrolyte, as is provided by the present invention.

By using the mixed organic solvents of the present invention, polysulfide with various oxidation numbers may be dissolved, providing more efficient sulfur utilization and rate capability than is available with the Chu solvent system. (see paragraphs 18-19 of the specification). Table 1, page 10 of the specification, recites examples of solvents that may be combined in accordance with the present invention, together with resulting discharging current density and sulfur utilization.

Although Chu utilizes some of the same solvents as the present invention, Chu utilizes different concentrations of the solvents, achieving a different percentage within Chu's combined solvent and thus achieving different results with respect to dissolution of polysulfides and different electrolyte characteristics. For example, as recited in col. 14, lines 42-55: "In general, the liquid electrolyte solvents of this invention include about 50 to 100% by weight of the main solvent

(excluding salts) which is usually one or more podand such as the above-described ethanediether compounds. The balance will be one or more of the cosolvents listed above. More preferably, the electrolyte solvents include about 50 to 100% by weight main solvent, and most preferably between about 70 and 90% by weight main solvent. As noted, the main solvent is one or more of the lithium coordinating ionophores described above (podands such as glymes, coronands such as crown ethers, or cryptands). Aside from the main solvent, the electrolyte solvent may include one or more cosolvents (described above) which make up the balance."

Thus, Chu preferably utilizes 70-90% of the main solvent, such as a glyme. In the present invention, (see Table 1 of the specification) the glyme examples include 20% to 60% glyme:

<u>Example No.</u>	<u>% Glyme</u>
1	60
2	40
3	40
4	32
5	40
7	20

As is clear from the examples, the weak polar solvent, e.g., glyme, of the mixed organic solvent of the present invention has a substantially different percentage composition (20-60%) than the most preferably utilized glyme composition utilized by Chu (preferably 70 to 90%). While Chu may utilize 50-100% glyme in the main solvent in a less preferred embodiment, when Chu utilizes 50% glyme, Chu includes a cosolvent such as donor cosolvents, acceptor cosolvents and additional cosolvents to make up the balance. Such cosolvents include (lines 15-41 of col. 14):

"Suitable donor cosolvents include hexamethylphosphoramide, pyridine, N,N-diethylacetamide, N,N-diethylformamide, dimethylsulfoxide, tetramethylurea, N,N-dimethylacetamide, N,N-dimethylformamide, tributylphosphate, trimethylphosphate, N,N,N',N'-tetraethylsulfamide, tetramethylenediamine, tetramethylpropylenediamine, and pentamethyldiethylenetriamine. These assist in solvation of lithium ions.

Suitable acceptor solvents assist in solvation of the sulfide and polysulfide anions. Acceptor solvents are those solvents which can be characterized as Lewis acids (they may be protic or aprotic solvents) and promote solvation of anions. Examples include alcohols such as methanol, glycols such as ethylene glycol, and polyglycols such as polyethylene glycol, as well as

nitromethane, trifluoroacetic acid, trifluoromethanesulfonic acid, sulfur dioxide, and boron trifluoride.

It should be understood that the electrolyte solvents of this invention may also include other cosolvents which do not necessary fall into the donor solvent and acceptor solvent classes.

Examples of such additional cosolvents include sulfolane, dimethyl sulfone, dialkyl carbonates, tetrahydrofuran (THF), dioxolane, propylene carbonate (PC), ethylene carbonate (EC), dimethyl carbonate (DMC), butyrolactone, N-methylpyrrolidinone, dimethoxyethane (DME or glyme), and combinations of such liquids."

In the present invention, in the examples below, glyme may be present in lower percentages:

<u>Example</u>	<u>% Glyme</u>	<u>% Sulfolane</u>	<u>% Dioxolane</u>	<u>% Other</u>
1	60	20	20	0
2	40	40	20	0
3	40	32	20	8
4	40	40	40	10
5	40	40	10	10
6	0	40	40	20
7	20	10	10	20

Independent claims 1, 12, 19 and 33 have been amended to recite the further limitation that, where the weak polar solvent is utilized, the mixed organic solvent includes less than 50% by weight of the weak polar solvent. Since the specification of Chu specifically recites: "in general, the liquid electrolyte solvents of this invention include about 50 to 100% by weight of the main solvent (excluding salts) which is usually one or more podand such as the above-described ethanediether compounds," it is respectfully submitted that such a limitation excludes the mixed solvents of the present invention as described in the amended independent claims.

Thus, it is respectfully submitted that claims 1-33 are allowable under 35 U.S.C. § 102(e) and are not anticipated by Chu et al. (USPN 6,030,720).

Since Nimon utilizes the same electrolytes as Chu (see lines 20-38, col. 6), it is respectfully submitted that claims 1-33 are allowable under 35 U.S.C. § 102(e) and are not anticipated by Nimon et al. (USPN 6,225,002) for at least the reasons that claims 1-33 are allowable over Chu.

Since Katz utilizes the same electrolytes as Chu and Nimon (see lines 14-54 of col. 10), it is respectfully submitted that claims 1-35 are allowable under 35 U.S.C. § 102(e) and are not

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anticipated by Katz et al. (USPN 6,358,643) for at least the reasons that claims 1-33 are allowable over Chu.

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance, which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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